SOLAR RADIATION AND SUNSPOT DATA FOR MARCH 1941

SOLAR RADIATION OBSERVATIONS

By HELEN CULLINANE

Measurements of solar radiant energy received at the surface of the earth are made at 9 stations maintained by the Weather Bureau and at 10 cooperating stations maintained by other institutions. The intensity of the total radiation from sun and sky on a horizontal surface is continuously recorded (from sunrise to sunset) at all these stations by self-registering instruments; pyrheliometric measurements of the intensity of direct solar radiation at normal incidence are made at frequent intervals on clear days at two Weather Bureau stations (Madison, Wis.; Lincoln, Nebr.) and at the Blue Hill Observatory at Harvard University. Occasional observations of sky polarization are taken at the Weather Bureau station at Madison and at Blue Hill Observatory.

The geographic coordinates of the stations, and descriptions of the instrumental equipment, station exposures, and methods of observation, together with summaries of the data obtained, up to the end of 1936, will be found in the MONTHLY WEATHER REVIEW, December 1937, pp. 415 to 441; further descriptions of instruments and methods are given in Weather Bureau Circular Q.

Table 1 contains the measurements of the intensity of direct solar radiation at normal incidence, with means and their departures from normal (means based on less than 3 values are in parentheses). At Lincoln the observations are made with the Marvin pyrheliometer; at Madison and Blue Hill they are obtained with a recording thermopile, checked by observations with a Smithsonian silver-disk pyrheliometer at Blue Hill. The table also gives vapor pressures at 7:30 a. m. and at 1:30 p. m. (75th meridian time).

Table 2 contains the average amounts of radiation received daily on a horizontal surface from both sun and sky during each week, their departures from normal and the accumulated departures since the beginning of the year. The values at most of the stations are obtained from the records of the Eppley pyrheliometer recording on either a microammeter or a potentiometer.

Total solar and sky radiation was somewhat above normal at Washington, Madison, Chicago, New York, Twin Falls, and Friday Harbor, and considerably deficient at Lincoln and Fresno.

Normal incidence measurements at Blue Hill Observatory showed a considerable excess in radiation, while at Madison there was an excess in February and a deficiency in March.

No polarization measurements were made during March at either Madison or Blue Hill.

A new cooperating station has been started at State College, Pa., and data from this station will appear regularly in the REVIEW beginning with the April number.

TABLE 1.—*Solar radiaton intensities during February 1941*

[Gram-calories per minute per square centimeter of normal surface]

Madison, Wis.

Date	Sun's zenith distance									
	7:30 a. m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°	1:30 p. m.
	75th mer. time	Air mass									Local mean solar time
		A. M.					P. M.				
	e	5.0	4.0	3.0	2.0	*1.0	2.0	3.0	4.0	5.0	e
	mm.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*mm.*
Feb. 18	0.4	0.98	1.10	1.26	1.42	1.60	1.40	------	------	------	0.7
Feb. 19	0.4	.88	1.03	1.15	1.37	1.58	1.40	------	------	------	0.8
Feb. 20	0.5	.98	1.10	1.22	------	------	------	------	------	------	1.1
Feb. 25	0.9	1.04	1.15	1.28	1.43	1.60	1.42	------	------	------	1.3
Feb. 28	1.4	.96	1.11	1.21	1.39	1.55	1.39	1.25	------	------	2.0
Means	------	.97	1.10	1.22	1.40	1.58	1.40	(1.25)	------	------	------
Departures	------	−.02	+.03	+.02	+.03	+.05	+.07	+.08	------	------	------

Solar radiation intensities during March 1941

Madison, Wis.

Mar. 4	1.2	.96	1.06	1.16	1.37	1.65	------	------	------	------	1.9
Mar. 5	1.6	.80	.92	1.06	1.26	1.62	1.38	------	------	------	2.2
Mar. 7	2.0	.87	.92	1.04	1.30	1.55	------	------	------	------	2.9
Mar. 13	1.3	.99	1.15	1.26	1.42	1.55	1.43	------	------	------	2.9
Mar. 14	1.1	.92	1.06	1.21	1.37	1.55	1.38	------	------	------	2.7
Mar. 17	0.4	1.03	1.14	1.30	1.46	1.64	------	------	------	------	0.7
Mar. 18	0.6	.94	1.03	------	------	------	------	------	------	------	1.3
Mar. 21	2.2	.68	.79	1.04	1.21	1.48	------	------	------	------	2.6
Mar. 22	3.0	.47	.61	.81	1.15	------	------	------	------	------	3.4
Mar. 28	3.6	------	------	------	1.16	1.55	------	------	------	------	3.4
Mar. 29	2.3	.57	.62	.77	.92	1.38	------	------	------	------	3.0
Means	------	.82	.93	1.07	1.26	1.55	1.40	------	------	------	------
Departures	------	−.06	−.07	−.07	−.05	−.01	+.10	------	------	------	------

Blue Hill Observatory

Mar. 2	2.8	0.98	1.08	1.20	1.35	------	1.36	1.26	1.14	1.04	2.4
Mar. 5	1.5	1.04	1.14	1.20	1.38	------	1.38	1.22	1.06	.96	1.5
Mar. 6	1.8	.81	.93	1.11	------	------	------	------	------	------	2.0
Mar. 10	2.2	1.00	1.10	1.22	1.34	------	------	------	------	------	2.6
Mar. 13	1.5	1.06	1.17	1.27	1.40	------	1.36	1.22	1.09	.98	1.1
Mar. 14	1.5	1.03	1.11	1.22	1.34	------	1.26	1.11	------	------	1.9
Mar. 20	1.4	------	------	------	------	------	------	1.19	1.06	.96	1.5
Mar. 21	1.5	------	------	1.14	1.28	------	1.31	1.15	------	------	2.1
Mar. 22	2.1	------	1.13	1.22	1.36	------	1.28	1.16	1.04	.96	2.5
Mar. 23	2.5	.94	1.03	1.15	1.30	1.49	1.31	1.14	1.00	.88	2.8
Mar. 26	2.9	.83	.96	1.09	1.29	1.50	1.28	------	------	------	2.3
Mar. 27	2.9	.70	.81	.97	------	------	------	------	------	------	3.2
Mar. 31	1.6	.90	1.00	------	1.26	------	------	------	.77	------	1.0
Means	------	.93	1.04	1.16	1.33	(1.50)	1.32	1.18	1.02	.96	------
Departures	------	+.03	+.06	+.06	+.09	+.07	+.08	+.09	+.05	+.08	------

*Extrapolated.

TABLE 2.—*Average daily totals of solar radiation (direct+diffuse) received on a horizontal surface*

[Gram-calories per square centimeter]

Week beginning—	Washington	Madison	Lincoln	Chicago	New York	Fresno	Cambridge	Fairbanks	Twin Falls	La Jolla	Newport	New Orleans	Riverside	Blue Hill	Albuquerque	Friday Harbor
	cal.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*
Feb. 26	284	261	269	197	318	145	243	131	262	328	268	384	240	227	498	195
Mar. 5	279	231	263	267	258	449	255	108	436	412	281	316	438	268	461	323
Mar. 12	397	454	392	307	356	351	342	216	472	365	371	277	316	360	390	286
Mar. 19	377	393	309	367	464	510	370	235	395	487	401	251	473	383	399	350
Mar. 26	398	347	376	271	458	410	428	229	377	453	449	481	404	441	618	343
DEPARTURES FROM WEEKLY NORMALS																
Feb. 26	+3	−9	−48	−1	+90	−118	−18	−8	−8	−65	−14	+112	−128	−74	+57	+28
Mar. 5	−32	−70	−68	+50	0	+46	−19	−48	+111	+15	−19	−9	+14	−26	+9	+104
Mar. 12	+76	+131	+22	+69	+87	−65	+15	+15	+137	−29	+15	−71	−95	+46	−20	+75
Mar. 19	+32	+65	−80	+108	+143	+56	−8	+24	+1	+66	−5	−106	+91	−11	−53	+66
Mar. 26	+50	−9	−4	+17	+66	−56	+18	−55	+26	−14	+34	+147	+21	+54	+90	+28
ACCUMULATED DEPARTURES ON APRIL 1, 1941																
	+2,051	+1,120	−3,331	+2,093	+5,012	−2,618	+7	−392	+1,799	−1,428	+175	+1,743	−3,577	−532	+511	+3,451

PROVISIONAL RELATIVE SUNSPOT NUMBERS FOR FEBRUARY 1941

[Based on observations at Zurich and Locarno. Data furnished through the courtesy of Prof. W. Brunner, Eidgen. Sternwarte, Zurich, Switzerland]

February 1941	Relative numbers	February 1941	Relative numbers	February 1941	Relative numbers
1	*a 75	11	36	21	*d* 40
2	69	12	30	22	26
3	*a* 65	13		23	15
4		14	29	24	*Ecd* 46
5	*Mcd* 85	15	*a* 27	25	54
6	*a* 64	16	8?	26	46
7	57	17	21	27	*b* 50
8	43	18	22	28	**ad* 56
9	*d* 58	19	*Wc* 28		
10	47	20			

Mean, 25 days=43.9

*=Observed at Locarno.
a=Passage of an average-sized group through the central meridian.
b=Passage of a large group through the central meridian.
c=New formation of a group developing into a middle-sized or large center of activity: *E*, on the eastern part of the sun's disk; *W*, on the western part; *M*, in the central-circle zone.
d=Entrance of a large or average-sized center of activity on the east limb.

Blank page retained for pagination